Rewriting conservation landscapes

protected areas and glacial retreat in the high Andes

Rasmussen, Mattias Borg

Published in:
Regional Environmental Change

DOI:
10.1007/s10113-018-1376-9

Publication date:
2019

Document version
Peer reviewed version

This is the author's postprint version of an article in *Regional Environmental Change*, vol. 19, pp. 1371–1385. The authoritative version can be found here: https://doi.org/10.1007/s10113-018-1376-9

The present research benefitted from funding from the European Research Council (ERC). ERC Grant: State Formation Through the Local Production of Property and Citizenship (Ares (2015)2785650 – ERC-2014-AdG – 662770-Local State).

Rewriting Conservation Landscapes: Protected Areas and Glacial Retreat in the High Andes

Author

Mattias Borg Rasmussen, PhD

Abstract and keywords

Glacial retreat reveals the unsettling effects of anthropogenic climate change, and challenges deeply seated cultural ideas about static landscapes. Glaciers have thus emerged as key signifiers of environmental loss. Because they are the outcomes of Westernized visions of the relationship between nature and culture, protected areas are important sites for understanding how notions of the Anthropocene come to reshape ideas about the future of glaciated landscapes. This article explores one particular conservation initiative, that of the establishment of the tourist and educational facility known as the Route of Climate Change in Peru's Huascarán National Park. It asks how we can understand the production of conservation landscapes in a context where the framing of glaciers as an endangered species denies their fluctuating dynamics and imparts to them a directionality towards irreversible change. Focusing on the contentious production of conservation landscapes through interaction between the park administration and a local community, the article is based on ethnographic fieldwork consisting of semi-structured interviews (48), informal conversations, and participant observation over multiple visits to the area between 2013 and 2015. The study finds that while the production of new conservation narratives certainly resituates the sites in time and place, it also produces uncertain environmental futures that may be molded to secure a rapprochement between park administrations and communities based on mutual alignment of conservation and community practices. It is thus argued that an underlying shift in orientation – from preserving what *is* to countering what might otherwise *come to be* – results in the production of new imaginaries about conservation landscapes that are both a condition and an outcome of protected area management in times of glacial retreat.

Key words: Glacier, Climate Change, Conservation, Landscape, Temporality, Imaginary, Andes

Introduction

Climate change introduces a new sense of time, where a logic of endless upward movement is replaced by radical decline, irreversible changes and unknown futures. The modernist sense of progress and growth is challenged by the realization of planetary boundaries (Eriksen 2016). In few places is the temporality of landscapes as clearly evidenced as in environmental decline in mountain areas, where cryospheric disruptions translate into icons of human impact on the globe and indexes of an uncertain future. The Anthropocene, that notion of human impact on the geophysical dynamics of the planet that has travelled from geology into social science, humanities, and politics, dissolves modernist distinctions between nature and culture (Moore 2016). Even if wilderness has always been meaningful only in relation to civilization (Cronon 1996), the Anthropocene in the context of global climate change and glacier recession makes public the impossibility of separating humans from their environment.

Protected areas become key sites for understanding the new sense of time and place. This article chronicles the efforts to establish *La Ruta del Cambio Climatico* (henceforth *La Ruta*) – the Climate Change Route – at the Pastoruri Glacier in Peru's Huascarán National Park. Pastoruri has shifted from being a site of summer pastures along a traditional trading route between two major valleys, to become a major tourist destination with skiing competitions and high school students sleighing down on black plastic bags (often abandoned after use, and so contributing to increased ablation rates), to being a virtually abandoned ruin of climate change (cf. Tsing 2015), to its current status as an icon of climate change used to promote a new kind of tourism and conservation landscape. In that context, *La Ruta* manifests itself in a number of different ways: it is the physical place with concrete infrastructures, signs and posters; it is the educational intervention that seeks to sensitize visitors and locals to the concrete manifestations of climate change; and it is the environmental narrative embodied by the glacier itself. In this process we see how glaciers emerge as a particular element of the conservation landscape. Indeed, the current infatuation with glaciers is in fact the outcome of a particular process through which glaciers have come to be figured as an endangered species and thus an object of conservation (Carey 2007a, 2016). We thus see a contradictory movement whereby glaciers are 'red-listed' and idealized in an optimal state of eternal equilibrium, and yet their environmental futures become apocalyptically scripted. *La Ruta* invites us to ask how we can understand the production of conservation landscapes in the contentious space between the framing of glaciers as an endangered species (cf. Carey 2007a), which denies them their fluctuating dynamics,

and the obvious and dramatic recession, which reveals the apparent futility of preserving bounded spaces. To provide an exploratory answer to that question is the main task of this article.

A *conservation landscape* is produced through a particular gaze, a set of discursive, scientific, and governmental techniques that colonizes the territory in a particular way. The emergence of new geographies in glaciated environments reveals a relationship between landscape, temporality, and imaginary. This argument rests on a theoretical approach to landscapes that is representational (Mitchell 2002), relational (Olwig 1996), and phenomenological (Ingold 2000, Tilley 2006). In this perspective, landscapes are neither containers nor sites but instead are produced through representations, in often uneven encounters, and through dwelling and other practical engagements. As noted by Bender (2002), 'the engagement with landscape and time is historically particular, imbricated in social relations and deeply political … the cultural meanings we give to time and place are not just reflections of these relationships; they carry their own political and social charge' (p. S104). Landscapes are social and political spaces imbricated with power; they not only reflect human agency, but condition it. Landscapes mean different things to different people and, consequently, struggles over conservation landscapes are both material and symbolic (Craig, Yung, and Borrie 2012). It thus becomes important to think about landscapes not only in relation to their role in a socio-economic sense as they link to *livelihoods*, but also in terms of how people dwell therein and produce them as part of a *life-world* in a broader, non-economic sense where places are repositories of meaning and identity. Conservation landscapes are thus produced in encounters; episodic and incomplete engagements between different sorts of actors and organizations with different meanings and identities. Against that background, what kinds of resolutions to conservation can be reached?

The conservation literature suggest the salience of narrative in the production of landscapes (see for example Neumann 1998, 29). This approach to understanding these subtle changes in the production of conservation landscapes in particular is shaped by insights generated from political ecology on degradation narratives (Benjaminsen et al. 2006, Leach and Mearns 1996) which argue that environmental narratives enable certain kinds of policy interventions, including conservation, while often obscuring other processes that might have affected degraded pastures or fickle waterways. Such environmental narratives are also central to the production of the cryosphere as a matter of concern in its own right (Jackson 2015, Nüsser and Baghel 2014). The point is not to suggest that environmental change in mountain regions is not an issue – quite to the contrary. Yet we need to consider that the framing of the impacts of climate change often has global roots. Environmental

narratives are produced in a context of global imaginaries of climate change (cf. Hastrup 2013) within which the interests of conservationists, scientists, adventure trekkers, journalists, and conventional tourists meet local livelihood concerns in the production of new conservation landscapes.

The temporality of conservation landscapes is produced not only by the historical sedimentations of social and cultural practices, conservationist and otherwise, but importantly also by the imagined environmental futures, the futurity of climate change. To Sverker Sörlin (2015), this is a cryo-historical moment where the historical power of human interventions become evident in the global retreat of glacial ice. Ice thus becomes a key trope of the Anthropocene. As suggested by Antonello and Carey (2017), it is exactly the convergence between ice as Earth time, human time, and future time which gives glaciers their particular temporalizing qualities, shaping environmental perceptions and perspectives. Glacial retreat framed by the Anthropocene thus produces a different kind of temporality of the conservation landscapes as these are oriented towards uncertain futures, becoming instrumentalized as mitigators and adaptive repositories.

Such temporal reorientations have implications for a park management. The stakes involved in climate change in the Andes are high: as glaciers retreat, new conservation priorities emerge that directly engage local livelihoods concerns related to changes in water quality and availability and dwindling revenues derived from tourism. Historically, Huascarán National Park has been connected to human population in four key domains: hazards, natural resources, tourist economy, and water supply (Carey 2016, 260). The acknowledgement that the future of these landscapes will be different changes the ways in which people – visitors, community members, and park personnel – engage with it. Such changes in glaciated landscapes prompt revisions and reinterpretations of conservation narratives that otherwise hinge upon notions of the idealized, static scenery. Here I focus in particular on the space between park administrations and local populations as a crucial site for the production and negotiation of these new imaginaries. The article suggests that climate change, considered as a context of social and institutional change, unsettles ideas about landscapes and their attendant livelihoods and life-worlds. I shall argue that the production of imaginaries about conservation landscapes is both a condition and an outcome of protected area management in times of glacial retreat.

Figure 1. Comunidad campesina de Catac is located in the southernmost reaches of Huascarán National Park. Map based on the community boundaries from page 14 in the community's biodiversity conservation plan and the official map of Huascarán National Park[1].

Map by Philip Stickler.

Methodology

Building on extensive ethnographic engagement with communities in the upper parts of the Santa River, the core of the paper is anthropological. Since 2010 I have worked closely with two *comunidades campesinas,* literally peasant communities, and documented their struggles to secure resources in a context where environmental change converged with new property and management regimes to produce a sense of uncertainty over which resources belong to whom. I spent 12 months in the field during 2010–11 and then returned in 2013, 2014, and 2015 for a total of five months. It was during these return visits that I was gradually drawn into the field of conservation. Part of the territory of the comunidad campesina that I spent most time with in those years, Catac, overlaps with the Huascarán National Park. Working partly with the community presidency and partly with the park administration in Huaraz enabled me to follow the negotiations over the establishment of *La Ruta*, a project mentioned in the 2010–2015 Park Management Plan (HNP 2011) but only inaugurated in June 2014.

For the research on the relationship between Catac and the national park I conducted 48 semi-structured interviews, which would usually last for an hour or more. When interviewing community members, I focused primarily on the history of the emergence of the community, the evolving forms of internal organization and institutionalization of resource control, and its relationship to the Huascarán National Park. I mainly interviewed community members who currently or previously occupied positions within the community leadership or water allocation system. When interviewing former and current park administrative officers and legal advisors to both park and community, I would focus in particular on conservation priorities and the shifting arrangements between park and community. In this article I rely on these interviews as well as the daily informal conversations and participatory observation at meetings, gatherings, and construction sites prior to the transfer from the

[1] Available at http://www.sernanp.gob.pe/huascaran. Accessed 18 June 2018.

municipality of Catac, which was responsible for the infrastructural work, to the park administration, which was responsible for its operation in collaboration with the Catac comunidad campesina. Interviews, field notes, and other data have subsequently been coded and analyzed in an iterative writing process which gradually built up the case.

The Production of Conservation landscapes

A new path has been constructed at approximately 5,000 meters above sea level in the Peruvian Andes. Solid rocks and concrete masonry climb the barren ascent, which some decades ago was covered with glacial ice. It takes visitors to the shore of the newly formed glacial lake at the Pastoruri Glacier. The retreat of the glacier implied a transformation of the tourist experience. The ice caves celebrated in thousands of photographs are gone, and it is no longer possible to touch the ice. Around 2006, debates over the future of Pastoruri were already taking place in the hallways of the park and the glaciology department: should it be closed down completely to reduce further wear, or restructured to reveal the story of human impact on the Andean landscape? After a few years of low-key debate, it was decided to prioritize the educational and touristic component – to let Pastoruri's decline become a public spectacle.

The idea of *La Ruta* was born in conversations between national park staff and the glaciology department at a time when the park saw a significant fall in the number of tourists. The new tourist infrastructures not only reflect a glacial landscape transformed, but also express a more orderly vision of the Peruvian tourism experience aimed at addressing the informality and irresponsibility that characterized it previously. Funded by Plan COPESCO, a state fund for investments in tourism, the idea of the project was twofold: to rebuild the touristic infrastructure and to reframe the significance of Pastoruri. A centrally placed person at the municipality in Catac told me that:

> One of the objectives was to provide more adequate infrastructure for tourists. To create convenience and consciousness [*comodidad y conciencia*] of the vulnerable state of Pastoruri. Another was to create income for the national park. To cover the costs of conservation. … Another point was to create income for community members providing services at Pastoruri … and in the town of Catac. All the objectives are within tourism. To preserve. A harmed natural area will always be harmed by people wandering around. With the income pastures can be improved. For example, before – before we had this consciousness – regrettably Pastoruri was not taken care of, you saw things thrown

> around, plastics, drinks. Before, the environment was degrading (Interview, June 16, 2014).

There is a conservation–tourism trade-off evident here: Pastoruri as a site is promoted for tourism to generate conservation outcomes elsewhere in the park. The sites that traditionally have been integral to the one-day tours from Huaraz to Pastoruri were therefore refurbished and improved. The infrastructure at Pastoruri itself was also vastly improved by building solid structures for the vendors (community members organized in cooperatives) as well as the above-mentioned trail that leads visitors all the way to the glacial lake. Even while knowing that the glacier is a merely a fraction of what it used to be, the path still reveals the awe-inspiring force of the high mountains.

A number of institutions operating on different scales, from communities and local government extension agencies to international conservation organizations, combined to produce conservation landscapes like *La Ruta*. Indeed, while the national park is itself a state institution, it does not express a unified state vision of nature protection vis-à-vis resource exploitation. As such the production of conservation landscapes at Huascarán reveals that while the Peruvian state has also played a key role in the production of 'nature' (Kelly et al. 2017), this has been and continues to be a territorial project rife with contradictions between ministries (e.g. between the Ministries of Environment, of Export and Tourism, and of Energy and Mines), specialized offices (e.g. agricultural extension offices, water management offices and glaciology departments), institutional competition (e.g. between the historical Glaciology Department described by Carey (2010) and the newly established Instituto Nacional de Investigación en Glaciares y Ecosistemas de Montaña (INAIGEM)), as well as between different branches and levels of government and their local campesino communities. All this creates fertile ground for strategic alliances and ongoing negotiations over conservation priorities, policies, and outcomes.

The above reservations notwithstanding, it should already be evident that a key actor in the production of the landscape in the Cordillera Blanca is the Huascarán National Park (Carey 2010, Carey, French, and O'Brien 2012, Rasmussen 2016b, 2018, Rasmussen, French, and Conlon forthcoming). Protected areas such as Huascarán National Park rest somewhat awkwardly on three pillars: conservation, education, and tourism. Environmental education targets both visitors and locals, and ideally should communicate the science behind conservation if these audiences are to value the conservation landscape and become active in its protection. Nonetheless, it is tourism that secures the economic viability of the Park along with other components of the regional economy. Studies of glacier tourism

suggest that a changing climate may expand the summer season, thereby creating a longer window for hikers and trekkers (Scott 2005, Welling, Arnason, and Olafsdottir 2015). In some places, like New Zealand, the Alps, or the Rocky Mountains, climate change has created a market for so-called last-chance tourism (Espiner and Becken 2014, Lemelin et al. 2010, Stewart et al. 2016, Purdie 2013, Steiger, Dawson, and Stotter 2012). Coral reefs, glaciers, low-lying islands and wetlands are examples of sites where visitors are invited in to get a last glimpse of a disappearing world. This tourism of urgency is in some ways different from the conservation landscape currently conjured by the Huascarán National Park. Like Bolivia's now vanished Chacaltaya glacier near La Paz, tourists come to the site for other purposes (Kaenzig, Rebetez, and Serquet 2016). *La Ruta* was conceived amidst concerns for securing the continued economic viability of the site. At Pastoruri the community tourist services only receive a fraction of the number of visitors who use to come in its heyday, and there is therefore a natural convergence between community and Park priorities on securing income from tourism[2].

The nickname of Huascarán National Park, the Swiss Peru (as Glacier National Park is the Swiss Rockies and Nahuel Huapi in Argentina the Swiss Argentina) suggests aesthetic affinities to other places and the salience of a particular set of Westernized valuations of the landscape. As elsewhere, these deeply humanized landscapes became subject to reinterpretations that produced a number of erasures. Contrary to the original wilderness model of Yosemite and Yellowstone (Cronon 1996, Loo 2001, Nash 2014), that translated into fortress-style conservation in colonial Africa (Brockington 2002, Gasteyer and Flora 2000, Neumann 1998, Neumann 2001), Latin American protected areas generally worked from the assumption of the humanized landscape (Wakild 2014, 2015, Young and Rodriguez 2006). This was also the case in the Cordillera Blanca. Mark Carey (2007a, b, 2010, 2012, 2016) has documented how a convergence of processes enabled the production of the Cordillera Blanca as a place of unique qualities: climbers, scientists, explorers, and later tourists imported ideas about this landscape that were radically different from locally held versions of a mountain topography saturated with meaning and history.

To conceptualize a conservation landscape as including human populations does not mean, however, that the production of these spaces was smooth and without contradiction and conflict (Lipton 2014, Rasmussen 2018, Rasmussen, French, and Conlon forthcoming). Rather, it involves discursive and

[2] See http://larepublica.pe/sociedad/964077-en-los-ultimos-12-meses-el-glaciar-del-pastoruri-retrocedio-mas-de-31-metros-video, accessed 12 December 2017.

regulatory operations that shape both livelihoods – e.g. restrictions on livestock or productive infrastructure (Rasmussen 2016b) – and life-worlds – e.g. new narratives on the sense of place, cultural identity, and historical rights (cf. Escobar 2001, Feld and Basso 1996, Moore 2005). Indeed, while the national park might say that Pastoruri belongs to them, members – the old ones in particular who are less versatile in legalistic language – of the community might claim that they belong to Pastoruri. As has been explored by Marisol de la Cadena (2015) in the Southern Andes, such expressions refer back to notions of being in-*ayllu*, that is, existing within intimate relations that go beyond human blood relations to kinship ties that unite family groups, places, and their so-called earth beings. For community members, therefore, it is also inaccurate to consider Catac as a 'gateway community' to the Huascarán National Park and Pastoruri. For these community members, Catac *is* Pastoruri.

As outlined below, several agendas were folded into the establishment of *La Ruta*, reproducing the pillars of conservation, education, and tourism as well as contestations over their relative importance. Before unpacking the specific case, we need to situate the establishment of *La Ruta* within its broader environmental context. The next section does that by exploring the relationship between glaciers, climate change, and protected areas.

Glaciers and Climate Change in Mountain Areas

The current lament over the uncertain futures of glaciated landscapes is the outcome of historical processes that have transformed glaciers from a looming menace, or unattractive wilderness, to an object worthy of concern, contemplation, and admiration (Carey 2007a). As with other iconic species in peril, glaciers carry meaning beyond their biophysical properties (Jackson 2015). It is no coincidence that Al Gore presented his 'An Inconvenient Truth' standing in front of one of the receding glaciers in Glacier National Park, Montana. As icons of the pristine, their rapid retreat challenges cultural ideas about static and unchanging landscapes to be preserved (Carey 2016, 2007a). Indeed, as suggested by Jessica O'Reilly in her study of the production of scientific facts in Antartica, glacial ice can act as a charismatic object. While scientists usually act as spokespeople for 'data', some materials may speak for themselves. Glacial ice combines an aesthetics of data (O'Reilly 2017) with the tangible aesthetics of the tourist landscape (Carey 2016) to produce a particularly strong narrative about irreversible change that carries meaning far beyond the specific glacier. Glacial retreat in protected areas thus reveals new dimensions to the dynamic mountain landscapes, offering a

provocation in Massey's (2006) sense, and producing a sense of urgency as the flow of water finds new ways and intensities, and the visual impression of the mountain range changes.

That national parks have roots in Western distinctions between nature and culture does not render local worldviews meaningless. Rather, it shows that the production of place and its attendant conflicts over meaning and erasures of local life-worlds are central to the semantic battlegrounds that protected areas create. Studies from the Rocky Mountains of the US (Binnema and Niemi 2006, Spence 1996) and Canada (Cruikshank 2001, 2005), Iceland (Jackson 2015), the Alps (Brugger et al. 2013) and the Himalayas (Nüsser and Baghel 2014, Paudel and Heinen 2015) suggest the salience of such dynamics. The presence of glaciers in the landscape invites contemplations over the divinity of place and the mighty powers of 'Nature' (Colley 2010). It is therefore no coincidence that glaciers have so often been celebrated in paintings, photography, poetry, and prose (Carey 2007a). They stand as sentinels of global climate change (Mark and Fernández 2017) even as they express culturally embedded ideas and valuations about the relationship between nature and society.

In the US, Glacier National park has become the poster child of climate change, and park management actively documents the profound changes in landscape through repeat photography.[3] In news stories on climate change and protected areas, Glacier National Park is a key referent[4], although concerns for the future of national parks in the US go beyond glaciers. In 2012, the advisory board to the National Park Services delivered a reassessment of park management objectives entitled *Revisiting Leopold: Resource Stewardship in the National Parks.* Acknowledging the profound and accelerating challenges to protected areas produced by climate change, the authors suggest that:

> The overarching goal of NPS resource management should be to steward NPS resources for continuous change that is not yet fully understood, in order to preserve ecological integrity and cultural and historical authenticity, provide visitors with transformative experiences, and form the core of a national conservation land- and seascape (NPS 2012, 11)[5].

[3] See http://reports.climatecentral.org/nps/glacier/, accessed 19 December 2017.
[4] See for example https://www.vox.com/2016/5/16/11666602/global-warming-national-parks; https://www.huffingtonpost.com/zachary-podmore/glacier-national-park-without-glaciers-climate-change-and-wildlife_b_5157223.html; both accessed 19 December 2017.
[5] See the full report here: https://www.nps.gov/calltoaction/PDF/LeopoldReport_2012.pdf .

The title suggests a shift in park management visions from the likes of Aldo Leopold and other founding figures, drawing park management concerns to wider landscapes, and wider temporal horizons and uncertain futures (see also Smith, Karosic, and Smith 2015). Concerns for climate change impacts on protected areas are not limited to the US. Globally, conservation NGOs work actively to reframe the role of protected areas in the context of climate change.

A selection of recent publications from conservation organizations (Murti and Buyck 2014, Londono et al. 2016, Iza and Rovere 2006, Kormos et al. 2017, Markham et al. 2016, Elbers 2011) shows the challenge that faces protected areas in times of climate change, and the changing role that these preserved landscapes may attain when ecosystems, topographies, and meteorological systems converge to produce new climate realities and vulnerabilities on the ground. In this process, protected areas emerge as both remedies for disaster risk reduction, adaptation – as in natural flood management, or the use of barriers – and mitigation, as in carbon sequestration. That is also the case in Peru.[6] Protected areas have thus achieved new roles in the context of climate change; in one publication they are even framed as 'safe havens' (Murti and Buyck 2014). Different images of the roles of protected areas are thus conjured by international and national actors: a Noah's Ark that encloses, but also a resource bank at the service of surrounding communities. Biblical undercurrents notwithstanding, the future orientation of these initiatives shapes conservation practices.

Perhaps nowhere has the history of disaster risk management been so intimately tied to institutional arrangements of environmental management as in the Cordillera Blanca (Carey 2010, 2012). As suggested above, globally protected areas have been promoted as instruments of both adaptation and mitigation by conjuring particular conservation landscapes of ruined futures. This may invite local stakeholders into decision-making processes. In Alaska, for example, the Climate Change Scenario Planning Project relies on adaptive management plans that 'regard public lands less as wilderness reserves with strict boundaries, and more as places that preserve history, nature, and culture' (Ernst and van Riemsdijk 2013, 23). Such initiatives indicate a rethinking of the boundary that delineates the protected areas. Even if Huascarán National Park was never intended to become a model fortress park, the boundaries increasingly become fluid and permeable with the intended effects of the protected area stretching far beyond its core. Rather than containment, connectivity becomes the aim.

[6] See for example https://elcomercio.pe/peru/areas-naturales-protegidas-cambio-climatico-peru-366001, accessed 19 December 2017.

Climate change alters the contours of mountain landscapes doubly (cf. Crapanzano 2004): *space* is visibly altered, but *time* also takes on a new shape. In the Cordillera Blanca, climate change is a deeply felt reality (Baraër et al. 2012, Bradley et al. 2006, Carey et al. 2014, Chevallier et al. 2011, Rasmussen 2015, 2016a, Mark et al. 2015, Mark and Fernández 2017, Viviroli et al. 2011, Vuille et al. 2003, Vuille et al. 2008, Vuille et al. 2018). As glaciers retreat, the biophysical changes in water availability, water flow, species up-migration and species extinction restructure agricultural and social practices. Across the length of the cordillera, rural communities are adjusting their livelihoods to new hydraulic realities (Bury et al. 2011, Bury et al. 2013, Carey et al. 2017, Polk et al. 2017, Vuille et al. 2018). Some have more water, others less. All seek to find ways of rendering such changes meaningful and manageable.

A number of reviews on the impacts of climate change on glacier–society relations have been published in recent years (Carey et al. 2017, Gagné, Rasmussen, and Orlove 2014, Vuille et al. 2018). Analyzing these changes from the vantage point of Andean farmers and pastoralists, it is often hard to distinguish between climate-related hazards and environmental calamities wrought by a profoundly unequal society (see Ribot 2010). Water availability is thus also a matter of institutional arrangements; crop plagues may be related to patterns of pesticide and herbicide use shaped by increasing reliance on fewer species of (for example) potatoes; soil erosion may be due to changing forest cover and composition; water quality is affected not only by newly exposed rock but also by informal and formal mining practices; and children suffering from bronchitis may not only experience the effects of more intense temperatures but also those of a defunct public health system and all-too-precarious housing conditions (McDowell and Hess 2012, Rasmussen 2016a, Valdivia et al. 2010, McDowell, Stephenson, and Ford 2014). The trouble is, as argued by Jesse Ribot (2014), that the distribution of harm and blame in the context of anthropogenic climate change singles out climate change while naturalizing existing vulnerabilities and their root causes. Such dynamics are also integral to new and old conservation landscapes.

Climate change, with its attendant reconfigurations of local hydrologics, happens in landscapes with deep histories, where the historical sedimentations are not only biophysical but also social, political, and cultural. Likewise, glaciers are not only biophysical elements, but also repositories of meaning and spirituality (Allison 2015). Shaping meaningful and manageable change in landscapes that are connected to both life-worlds and livelihoods is therefore linked to the ways in which other institutions and organizations frame narratives, policies, and interventions. The way the landscape is

known to those who dwell in it (Ingold 2000) emerge in these epistemological and sometimes ontological encounters. Protected areas thus become key sites for understanding the emergence of particular landscapes through the production of knowledge and its representation through imagery, scientific reports, management plans, and tourist marketing. The next section unpacks the particularities of such conservation encounters in the case of Huascarán National Park and the Catac campesino community.

Figure 2 Approaching Pastoruri along the gravel road. Since debates over the establishment of *La Ruta* began in 2006, the glacier has been split in two by its retreat. The parking lot and vendors site where the path to Pastoruri begins is marked by a circle. Photograph by the author.

Conservation Encounters at Pastoruri and Beyond

The construction of *La Ruta* must be understood in the context of the sometimes tense relationship between the park and the community in Catac. Three issues in particular complicate the conservation encounters: the amount of livestock, the construction of productive infrastructure, and revenues from tourism (Rasmussen 2016b, 2018). Each of these issues should be understood in the context of local notions of sovereign resource control, the recovery of ancestral rights, and historically conditioned notions of belonging to these territories. The paragraphs below focus on three key areas: tourism as it relates to Pastoruri, water control as it relates to agriculture, and wetland management as it relates to livestock.

The decision to create *La Ruta* happened in the aftermath of a longstanding legal process between the park and the peasant community in Catac, which followed the 2001 community occupation of the entrance (Rasmussen, French, and Conlon forthcoming). This was resolved in court in 2007, and finally settled in 2009. *La Ruta* was launched without intensive community engagement. The park administration regarded the refurbishing of Pastoruri as an infrastructural matter that did not require consent or consultation. Largely sidelined during the process, the community's leadership remained relatively indifferent. In terms of the contract of collaboration between the community and the park, community members were offered positions in the construction process, but few took up this offer and labor had to be imported from elsewhere. Community leadership attitudes to *La Ruta* changed when the date for handing over the project approached. Until then the parties in the process had been

the Huascarán National Park, the municipality in Catac, and the construction consortium (the first consortium had financial difficulties halfway through, and a second one took over). The handing over sparked renewed interest among the leadership in Catac, aimed at securing the community's (rather than the Park's) legal ownership of the new infrastructures, worth some 6,000,000 nuevos soles (approximately 2,000,000 USD). According to their line of reasoning, Pastoruri and its community are inseparable. *La Ruta* simply could not be the property of the Park. The project was thus inscribed into ongoing contests over resource control.

While Catac community leaders see their situation as one in which they need to redefine and refine their economic strategies by expanding their business portfolio, the management plan of the park, and the legal decree by which the park was founded, emphasize that only traditional activities are allowed inside the park. This does not quite reflect the self-understanding of community members. A former president explained to me how they were frustrated when the park was established because it 'ruined our dreams' of extraction by 'demanding that we act according to our *usos y costumbres*'. While he is referring to a number of concrete existing and planned explorations of both minerals and construction materials, whose extraction would be an important addition to the community business portfolio, his main concerns were not the principles of conservation activities, but the unevenness with which these were being implemented. For a community that is always seeking to expand its economic activities, the prospects of *La Ruta* were quite good, since it was likely to attract more tourists. Yet his analysis of the situation also reveals some reservations with regard to conservation and its enforcement: glacial melt reflects not only warming temperatures but also the irresponsibilities of managers and visitors:

> The idea of *La Ruta* came from the national park when they noticed the glacier was disappearing. So they wanted to stop all skiing competitions, all those people walking around. And lately, with climate change, the glaciers have vanished almost completely. They make these little huts so that people can see what it used to be like and how it is now. This was born with the way of thinking of those from the park. The *funcionarios*. It is good, I think. Even when there is no glacier tourists will still come and leave an income to the people (Interview, May 17, 2014).

The former president here rehearses the common argument that glacial retreat at Pastoruri was exacerbated by irresponsible tourism. He was himself deeply involved in the tourist business, being one of the founders of the horse-riding rental cooperative in the early 1980s. While Pastoruri thus

provides a glimpse of the environmental future, his statement suggests the enduring importance of the tourism economy as well as its dispersed ownership among community members. Not all accrue benefits from tourism.

Other dimensions of glacial retreat in the Cordillera Blanca were articulated at *La Ruta.* The conservation landscape is shaped by links between glaciers and downstream hydrology. Conceptualized as 'water towers', glaciers provide a stable source of water in regions that experience marked differences between dry and wet seasons. Studies have shown how glacial retreat initially produces an escalating supply of water until 'peak water' is reached. Thereafter, the outflow of water declines until it settles at a lower 'normal' flow. While glaciers stand as symbols of a world in peril, assumptions about their role as 'water towers' gloss over local differences in impact on downstream societies by suggesting that they lend themselves unproblematically to techno-fixes. Studies of water management in the context of climate change (Carey et al. 2017, Lynch 2012, Mark et al. 2015, Mark et al. 2017) as well as classic Andeanist irrigation studies (Gelles 2000, Trawick 2003) show how water enters social worlds, troubling linear causalities that derive the impact of rates of glacial retreat on human societies without taking into account the institutional context in which the flow of water becomes embedded.

Much of the water that leaves Pastoruri or one of the other glaciers is quickly put to use in one of the 20 irrigation canals that traverse the territory in Catac. The impossibility of separating environment, social arrangements, and human needs are evident in this statement by another community member:

> There were demands, there was a water crisis. We had little water. As you have seen in the canal which comes down to Catacpata, we have completely drained the river. Its flow is minimal. We have drawn all of it into the canal. But there is not enough. There is a demand to irrigate pastures. People said that they wanted to sow, but that there is no water. [The river] has lowered. It has lowered a lot. Before the ecological flow ['caudal ecologico', a water engineering term for the sustainable flow in a river bed] was higher. Now it is [a minimal residue that] flows down the river. (Interview, May 25, 2014).

Assessing changing water regimes in a context where sensitivity to climate change is also produced by precipitation, water storage capacity, and ground water availability further contributes to complicating the linear relationship between glaciers and downstream water availability conjured by

the image of the water tower (Carey et al. 2017, Escurra et al. 2014, McDowell et al. 2013). The community member quoted above shares an analysis of water availability as a deeply political and social issue.

The contested terrain of resource control found a different expression inside the new structures. At the control post at Carpa, a visitors' center was built. This includes an exhibition focusing on the changing Andean landscape. A number of *maquetas*, three-dimensional relief maps carved out in wood, display the landscape and show glacial retreat for most of the major peaks and icefields. An information poster reveals the importance of the wetlands for water storage and purification. Another poster seems to be particularly significant, showing the endangered species and the major threats to their conservation. What is noticeable here is that all these focal points of concern relate to everyday practices of the people who dwell in these landscapes: the burning of pastures and forests; livestock competing for food resources; hunting (framed as poaching by the park, or as a means of subsistence by community members); and the fragmentation of habitats due to a combination of the above. The main threat to biodiversity communicated to the public, in other words, arose from the productive practices of community members.

A major concern for the park administration is the persistence at altitude of large numbers of animals and the detrimental effects these have on the capacity to retain and store water in the wetlands. Community members, however, stubbornly insist on their right to resource control – including local practices of establishing drainage canals to expand the pastures, avoid the proliferation of parasites that dwell in still water, and reduce the risks of drowning. Some time before the inauguration of *La Ruta*, I stood with a former president of Catac, overlooking an area *en route* to Pastoruri which is heavily drained or *desangrado* ('bled'), the term used for a practice that allows herders to maintain animals on their summer pastures. I had asked him to come with me to Pastoruri on this day in his capacity as president during the protests against the park in 2001. In a worn-out Japanese station wagon we were moving slowly upwards on the gravel road that the community is now responsible for maintaining, making stops along the way to discuss the sedimented history of community practices – productive, economic and political – in the Andean landscapes. The drainage of wetlands in Pumapashimin contained multiple narratives of community dwelling in these landscapes. 'The wetlands', he explained, 'were more abundant when I was a child.… But in 1975 enters the park, right. As a protected area. It makes me wonder. What have they done to conserve – and by conserving (*para conserver, y por conservar)* – all the wetlands? Because now they are becoming extinct. For

example, you have seen in Pumapashimin there are no reeds. They are gone. What is the function of the park? Isn't to preserve flora and fauna?' (Interview, May 31, 2014). The relationship to the park is indeed contradictory, and there are few clear-cut positions either for or against it.

Figure 3 Overlooking a drained wetland just before reaching the ascent known as Siete Curvas. The drainage canals, *zanjas*, are clearly visible even from a distance. For community members this practice expands pasturelands and reduces the risk of drowning and infections. Photograph by the author.

I was discussing the establishment of *La Ruta* with a key figure from the Huascarán National Park as we drove along the newly established road that cuts its way through the Cordillera Blanca connecting the Callejón de Huaylas to the Callejón de Conchucos. 'The idea is to educate', he told me. 'We need to show visitors how important the ecosystems are, how each of them works, and show how climate change affects all those ecosystems from the glaciers to the wetlands and valley …. In situ, they can see the impacts of climate change on these ecosystems.' He was especially happy with the poster showing the 'most recent research' on the role of the wetlands:

> When the Cataquinos see this, they will say 'wow'. They know that the water that comes from up high is acid, that you cannot drink it. But this water is clean. So who made this work of the filtration? Not any human being. It is the wetland ecosystems, because water runs through them (Interview, August 11, 2015).

Not only can wetlands store water, but they can also buffer the increased acidity of water created by glacier recession (see Polk et al. 2017, Mark et al. 2017). The model of the glacier as a water tower lends itself easily to popular understanding. While glaciologists and hydrologists – sometimes in tandem with social scientists – may complicate that notion by pointing to other biophysical and social factors that shape the flow of water, the 'glacier = water' and 'altitude = tower' model is easily grasped and translated into a bounded and well-defined problem. When the model of the water tower is transferred to the wetland, the relations may seem equally simple. However, wetlands are deeply social and tied to both livelihoods and life-worlds (Zimmerer 1993). They are sites not only of important productive practices, but also of dense social and cultural significance. While rural livelihoods are changing, Andean life-worlds in the phenomenological sense are also taking on new shapes as landscapes become disenchanted and rural dwellers increasingly orient themselves towards

urban attractions. While climate change provides a strong element within the community narrative to account for these changes, its story is always told in combination with anthropogenic forces of change.

La Ruta consists of a number of infrastructural improvements along already well-known sites, but the naming and scientific framing of the installations produce new representations of the landscapes. The representations have territorializing effects. It is hard to find community members who are against conservation as a principle of resource management, but fairly easy to find those who oppose the different iterations of the territorializations of park management. Resource control – particularly water, pastures, and minerals – and the control over revenues from tourism – which has been a long-standing issue in the relationship between Catac and the park – were therefore also folded into the negotiations over the establishment of *La Ruta.* The next section discusses the temporalizing effects of these interventions.

Environmental narratives and the production of imaginaries of the future

The high-school students racing down on black plastic bags were a provocation to the natural beauty of the Andean landscapes, and a radical rendering of the modernist conquest of the high altitudes. Indeed, irresponsible tourists may well have contributed to the premature departure of Pastoruri. If the nature–culture distinction was the underlying vision of yesteryear's protected areas, a new global consciousness about the role of humans in shaping the future of the Earth is emerging. Protected areas take on new forms in the Anthropocene, where landscapes become vested with human agency. Below I focus in particular on the entwinement of two complementary narratives: glacial retreat and wetland restoration.

As the beneficial role of glaciers in the local socio-hydrological cycle diminishes, there is an increasing focus on the possibility of highland wetlands, the *bofedales* in Peru or the *páramos* in northern Peru, Ecuador, and Colombia (Polk et al. 2017). This goes well with ecosystem-based adaptation, which has emerged as one way of using protected landscapes to buffer the adverse effects of climate change. In the Peruvian Andes, NGOs such as the Mountain Institute have been at the forefront of implementing projects that ensure the regeneration of wetlands, and the park administration emphasizes the potential role of *bofedales* as 'the new water towers' of the Cordillera

Blanca (as expressed in the project *Yakunaani – La Ruta del Agua Blanca*[7]). As evident in the above, the recovery of *bofedales* in the Cordillera Blanca reignites the enduring issue of overgrazing in the relationship between the local communities and the park administration's conservation and tourist agendas.

La Ruta and its attendant infrastructures suggest a reinforcement of the spatial divisions between education, conservation, and tourism. Conservation landscapes rest on strong scientific narratives about ecosystems and biodiversity (Orlove and Brush 1996). At Huascarán National Park, historically, mountain adventurers and scientific expeditions have paved the way for the production of the valued tourist scenery (Carey 2016). The current endeavors to reframe the conservation landscape rest on a similar vision of the Cordillera Blanca as a site of scientific inquiry, and should be linked to the park's official role, alongside its tourism-oriented and scientific purposes, as an environmental educator (see HNP 2011, p. 203). Via the coupled routes of 'Climate Change' (glacier) and Aguas Blancas (wetlands) an undefined public (visitors, school children, community members) should be educated through conservation initiatives that affect local resource use and control. This is clear in the shift from glaciers to wetlands through the emphasis on ecosystem-based adaptation, while the glacier at Pastoruri is left for educational purposes.

While the science behind the model of wetlands as water tower and treatment plant seems solid, it nonetheless has implications for how conservation initiatives are thought. There is an increasing awareness that ecosystems stretch beyond national park boundaries (Bray 2015). Huascarán National Park was recognized in 1978 as a UNESCO Biosphere Reserve. The designation specifically highlights the importance of both natural and cultural resources. While the biosphere reserve narrates a backward-looking story about the sedimented socio-natural histories of the Cordillera Blanca, the ecosystem service approach represents a remarkable shift from the park nucleus as a subject in its own right to its attainment of value by virtue of its ability to connect to downstream communities and serve as a buffer to the adverse impacts of climate change on water quality and quantity.

La Ruta thereby combines two environmental narratives that operate on quite different spatio-temporal scales. The glacial retreat and its consequent reduction in streamflow are linked to a global scale, while the root causes of biodiversity threats continue to be embedded in local contexts. Furthermore, the emphasis on ecosystem-based adaption puts pressure on livestock practices with

[7] See http://larepublica.pe/rumbos/857068-parque-nacional-huascaran-recupera-bofedales, accessed December 8, 2017.

little mention of the reasons *why* people maintain animals at altitude and *how* their practices have shaped the Andean landscapes historically. Crucially, shaped by climate change discourse, both environmental narratives contain elements of temporality that combine the irreversibility of glacial retreat with the potentiality of local-level interventions. They reorient the landscape towards uncertain but moldable environmental futures. This reorientation may also contain seeds for reconciliation and rapprochement between park administration and communities. Moldable environmental futures can potentially align conservation and community priorities, but this requires a deeper understanding of the structural reasons related to production, irrigation, market articulation and credit–debt relations that up to the present offer little alternative for community members other than to maintain economically viable but environmentally harmful amounts of livestock at altitude. So far, the ideological and narrative distance between the park and the communities remain large, even as they work together in a single landscape.

The new conservation narrative resituates the sites in time and space. Ecosystem-based adaptation is emerging as a key priority if protected areas are to counter the adverse effects of climate change. Whether aimed at mitigation by storing carbon or adaptation by replacing one system of hydrologics with another, these increasingly recognize that it is not only water cycles that are hydrosocial, since the entire planetary system is Anthropocene. Notwithstanding the geological definitions, the Anthropocene provides a powerful master narrative that figures possible solutions (Ribot 2014). To Amelia Moore (2016) the Anthropocene is part of a positive feedback cycle, where ideas about anthropogenic planetary change shape not only policy and research outcomes, but also understandings of global transformations, sociality, ecology, and landscape formations that in turn reinforce the Anthropocene. The Anthropocene is, in other words, a framing – or a narrative – which shapes the way that social and environmental change is conceptualized and acted upon.

Conservation in the Anthropocene is exemplary of the planetary entanglements that rescale local phenomena. As glaciers become sentinels and icons of such linkages between global processes and site-specific impacts, they condition local-level interventions through their role in the production of new imaginaries. To Kirsten Hastrup (2013), we are on the verge of a new global imaginary that is linked to climate change and notions of the Anthropocene. Building on Taylor's analysis of the modern social imaginary as a shared set of understandings and interpretative frameworks that not only shape but actually naturalize everyday interactions and encounters (Taylor 2002, see also Mendoza et al. 2017), Hastrup suggests that the new global imaginary destabilizes settled notions

about nature and culture, state and citizens, and cause and effect. The shift from the modern global imaginary as detailed by Taylor to Hastrup's global social imaginary can be traced in the rearrangement of conservation landscapes where the modern distinction between nature and culture has been complicated by the acknowledgement of anthropogenic climate change. The new conservation landscapes therefore also imply a shift in orientation in time from preserving what *is* and what *was* (for potential educative display in the future) to countering what might *become* that future.

Conclusion: Rewriting Conservation Landscapes

Conservation is intimately linked to modern social imaginaries. Historically, protected areas are outcomes of visions of the relationship between the metropolis and wilderness, between society and nature (Cronon 1996). It has been a project tied to technology and science (Grove 1995), but also one which is deeply connected to regimes of spatial control, and colonialism in its different guises of internal control as well as aspirations of empire (Beinart and Hughes 2007, Neumann 2001, Rasmussen and Lund 2017). Conservation landscapes are *made* by strategic erasures and essentialisms. Sometimes these operations are subtle and discursive, sometimes – especially in the African context – deeply violent (Neumann 1998, West, Igoe, and Brockington 2006). Climate change challenges established notions of these landscapes. As sandy beaches erode, coral reefs bleach and die, and glaciers retreat, local populations, park personnel, and policy makers alike seek to render these changes meaningful as social, institutional, and even ontological orders are unsettled. In that process, new imaginaries of place and planetary entanglements emerge.

The production of conservation landscapes combines situated struggles over livelihoods and life-worlds with scientific narratives and (assumed) tourist valuations of the landscape. While efforts to secure resource control endure even as new environmental narratives shape understandings of mountain ecologies and hydrologies, the temporal reorientation offers possible rapprochement between the park and community as the future turns out to be a shared object of concern. Protected areas have been instrumental in the production of glaciers as an endangered species (Carey 2007a). As glaciers retreat, these sites become global icons of climate change. Mt Kilimanjaro, Mt Rainier, and Pastoruri emerge alongside polar bears, rupturing ice sheets, and super cyclones as testimonies to a world gone awry. International conservation organizations and NGOs have been effective in using the glaciated protected areas to raise concerns over the future of mountain ecosystems and downstream societies. Glaciers here become key signifiers in the production of a global imaginary of

anthropogenic climate change. Local-level park managers are therefore conditioned by the restructuring of the role of protected areas, but they also co-produce these global imaginaries in their efforts to create new conservation narratives. In other words, the production of imaginaries about conservation landscapes is both a condition and an outcome of protected area management in times of glacial retreat.

Acknowledgements

Particular thanks go to Jesus Gomez for his patience and friendship. Thank you also to the many community members who cared for me, willingly answered my questions, and showed me ways into their magnificent and troubled landscapes. I wish to thank Christian Lund, Ben Orlove, Mark Carey, Karine Gagné, Rune Bennike and Jevgeniy Bluwstein for providing critical feedback. Thanks also to the four reviewers for their engaged reading. Funding for the fieldwork was provided by the Independent Danish Research Council. During fieldwork I was affiliated to Pontificia Universidad Católica del Perú in Lima.

1. Bibliography

Allison EA 2015. The spiritual significance of glaciers in an age of climate change. *Wiley Interdisc. Rev: Climate Change* 6 (5):493-508. doi: 10.1002/wcc.354.

Antonello A Carey M 2017 Ice Cores and the Temporalities of the Global Environment. *Environmental Humanities* 9 (2):181-203. doi: 10.1215/22011919-4215202

Baraër M Mark BG McKenzie JM Condom T Bury J Huh K-I Portocarrero C Gómez J Rathay S 2012 Glacier Recession and Water Resources in Peru's Cordillera Blanca. *J Glaciol.* 58 (207):134-150. doi: 10.3189/2012JoG11J186.

Beinart W L Hughes 2007 *Environment and empire*. Oxford: Oxford University Press

Bender B 2002 Time and Landscape. *Curr. Anthropology.*43 (S4):S103-S112. doi: 10.1086/339561.

Benjaminsen TA Rohde R Sjaastad E Wisborg P Lebert T 2006 Land Reform, Range Ecology, and Carrying Capacities in Namaqualand, South Africa. *Ann. Assoc. Am. Geographers* 96 (3):524-540. doi: 10.1111/j.1467-8306.2006.00704.x.

Binnema T Niemi M 2006 ‘Let the Line be Drawn Now’: Wilderness, Conservation, and the Exclusion of Aboriginal People from Banff National Park in Canada. *Environmental History* 11 (4):724-750. doi: 10.1093/envhis/11.4.724.

Bradley RS Vuille M Diaz HF Vergara W 2006 Threats to Water Supplies in the Tropical Andes. *Science* 312 (5781):1755-1756. doi: 10.1126/science.112808.

Bray PM 2015 From Park-Centric Conservation to Whole-Landscape Conservation in the USA. In *Nature Policies and Landscape Policies: Towards an Alliance*, edited by Gambino R Peano A, 51-58. Cham: Springer.

Brockington D 2002 *Fortress conservation: the preservation of the Mkomazi Game Reserve, Tanzania*. Bloomington: Indiana University Press.

Brugger J Dunbar KW Jurt C Orlove B 2013 Climates of anxiety: Comparing experience of glacier retreat across three mountain regions. *Emotion, Space and Society* 6:4-13. doi: 10.1016/j.emospa.2012.05.001.

Bury J Mark BG Carey M Young KR McKenzie JM Baraer M French A Polk MH 2013 New Geographies of Water and Climate Change in Peru: Coupled Natural and Social Transformations in the Santa River Watershed. *Ann. Assoc. Am. Geographers* 103 (2):363-374. doi: 10.1080/00045608.2013.754665.

Bury, J Mark BG McKenzie JM French A Baraer M Huh K-I Zapata Luyo MA Gómez López J 2011 Glacier recession and human vulnerability in the Yanamarey watershed of the Cordillera Blanca, Peru. *Climatic Change* 105 (1-2):179-206. doi: 10.1007/s10584-010-9870-1.

Carey M 2007a The history of ice: how glaciers became an endangered species. *Environmental History* 12 (3):497-527. doi: doi.org/10.1093/envhis/12.3.497.

Carey M 2007b The Nature of Place: Recent Research on Environment and Society in Latin America. *Lat. Am. Res. Rev.*42 (3):251-264. doi: 10.1353/lar.2007.0033.

Carey M 2010 *In the Shadow of Melting Glaciers: Climate Change and Andean Society*. Oxford: Oxford University Press.

Carey M 2012 Mountaineers and Engineers: The Politics of International Science, Recreation, and Environmental Change in Twentieth-Century Peru. *Hispanic Am. Historical Rev.* 92 (1):107-141. doi: 10.1215/00182168-1470986.

Carey M 2016. The Trouble with Climate Change and National Parks. In *National Parks Beyond the Nation : Global Perspectives on "America's Best Idea"*, Howkins A Orsi J Fiege M (eds). Norman: University of Oklahoma Press.

Carey M Baraer M BG Mark A French J Bury KR Young JM McKenzie 2014 Toward hydro-social modeling: Merging human variables and the social sciences with climate-glacier runoff models (Santa River, Peru). *J Hydrol.* 518, Part A:60-70. doi: 10.1016/j.jhydrol.2013.11.006.

Carey M French A O'Brien E 2012 Unintended Effects of Technology on Climate Change Adaptation: An Historical Analysis of Water Conflicts below Andean Glaciers. *J Historical Geography* 38 (2):181-191. doi: 10.1016/j.jhg.2011.12.002.

Carey M Molden OC Rasmussen MB Jackson M Nolin AW Mark BG 2017 Impacts on Glacier Recession and Declining Meltwater on Mountain Societies. *Ann. Assoc.Am. Geographers*. doi: 10.1080/24694452.2016.1243039.

Chevallier P Pouyaud B Suarez W Condom T 2011 Climate Change Threats to Environment in the Tropical Andes: Glaciers and Water Resources. *Regional Environmental Change* 11 (1):179-187. doi: 10.1007/s10113-010-0177-6.

Colley AC 2010 *Victorians in the mountains, sinking the sublime*. Burlington, VT: Ashgate.

Craig D Yung L Borrie W 2012 "Blackfeet Belong to the Mountains": Hope, Loss, and Blackfeet Claims to Glacier National Park, Montana. *Conservation and Society* 10 (3):232-242. doi: 10.4103/0972-4923.101836.

Crapanzano V 2004 *Imaginative Horizons: An Essay in Literary-Philosophical Anthropology*. Chicago and London: University of Chicago Press.

Cronon W 1996 The Trouble with Wilderness: Or, Getting Back to the Wrong Nature. *Environmental History* 1 (1):7-28. doi: 10.2307/3985059.

Cruikshank J 2001Glaciers and climate change: perspectives from oral tradition. *Arctic* 54 (4):377-393. doi: jstor.org/stable/40512394.

Cruikshank J 2005. *Do glaciers listen? Local Knowledge, Colonial Encounters, and Social Imagination*. Vancouver and Toronto; Seattle: UBC Press; University of Washington Press.

De la Cadena M 2015 *Earth Beings: Ecologies of Practice across Andean Worlds*. Durham. NC: Duke University Press.

Elbers J (ed.) 2011 Las áreas protegidas de América Latina: Situación actual y perspectivas para el futuro. Quito, Ecuador: IUCN.

Eriksen TH 2016 *Overheating. An Anthropology of Accelerated Change*. London: Pluto Press.

Ernst KM van Riemsdijk M 2013 Climate change scenario planning in Alaska's National Parks: Stakeholder involvement in the decision-making process. *Applied Geography* 45:22-28. doi: 10.1016/j.apgeog.2013.08.004.

Escobar A 2001 Culture Sits in Places: Reflections on Globalism and Subaltern Strategies of Localization. *Political geography* 20 (2):139-174. doi: 10.1016/S0962-6298(00)00064-0.

Escurra JJ Vazquez V Cestti R De Nys E Srinivasan R 2014 Climate change impact on countrywide water balance in Bolivia. *Regional Environmental Change* 14 (2):727-742. doi: 10.1007/s10113-013-0534-3.

Espiner S Becken S 2014 Tourist towns on the edge: conceptualising vulnerability and resilience in a protected area tourism system. *J Sustainable Tourism* 22 (4):646-665. doi: 10.1080/09669582.2013.855222.

Feld S KH Basso 1996 *Senses of place*. Santa Fe, NM: School of American Research Press.

Gagné K Rasmussen MB Orlove BS 2014 Glaciers and society: attributions, perceptions, and valuations. *Wiley Interdisc. Rev.: Climate Change* 5 (6):793-808. doi: 10.1002/wcc.315.

Gasteyer SP Flora CB 2000 Modernizing the savage: Colonization and perceptions of landscape and lifescape. *Sociologia Ruralis* 40 (1):128-149. doi: 10.1111/1467-9523.00135.

Gelles PH 2000 *Water and Power in Highland Peru: The Cultural Politics of Irrigation and Development*. New Brunswick, NJ: Rutgers University Press.

Grove RH 1995 *Green imperialism: colonial expansion, tropical island Edens and the origins of environmentalism, 1600-1860*. Cambridge: Cambridge University Press.

Hastrup K 2013 Anthropological Contributions to the Study of Climate: Past, Present, Future. *Wiley Interdisc.Rev.: Climate Change* 4 (4):269-281. doi: 10.1002/wcc.219.

HNP (Huascarán National Park) 2011 Plan Mastro 2010-2015. Huaraz: SERNANP

Ingold T 2000 *The Perception of the Environment. Essays in Livelihood, Dwelling and Skill*. London and New York: Routledge.

Iza A Rovere MB 2006 Aspectos jurídicos de la conservación de los glaciares. Gland, Schwitzerland: IUCN.

Jackson M 2015 Glaciers and climate change: Narratives of ruined futures. *Wiley Interdisciplinary Reviews: Climate Change* 6 (5):479-492. doi: 10.1002/wcc.351.

Kaenzig R Rebetez M Serquet G 2016 Climate change adaptation of the tourism sector in the Bolivian Andes. *Tourism Geographies* 18 (2):111-128. doi: 10.1080/14616688.2016.1144642.

Kelly M Leal C Wakild E Graf von Hardenberg W 2017 Introduction. In *The Nature State. Rethinking the History of Conservation*, Hardenberg WG Kelly M Leal C Wakild E (eds). London: Routledge, pp. 1-15

Kormos CF Badman T Jaeger T Bertzky B van Merm R Osipova E Shi Y Larsen PB 2017 World Heritage, Wilderness and Large Landscapes and Seascapes. Gland, Switzerland: IUCN.

Leach M Mearns R 1996 *The lie of the land : challenging received wisdom on the African environment, African issues*. Oxford ; Portsmouth, NH: International African Institute in association with James Currey : Heinemann.

Lemelin H Dawson J Stewart EJ Maher P Lueck M 2010 Last-chance tourism: The boom, doom, and gloom of visiting vanishing destinations. *Curr. Issues in Tourism* 13 (5):477-493. doi: 10.1080/13683500903406367.

Lipton JK 2014 Lasting Legacies: Conservation and Communities at Huascaran National Park, Peru. *Society & Natural Resources* 27 (8):820-833. doi: 10.1080/08941920.2014.905888.

Londono JM Prieto Albuja FJ Gamboa P Gorricho J Vergara A Welling L Wyborn C Dudley N 2016 Editorial: Protected Areas as Natural Solutions to Climate Change. *Parks* 22 (1):7-12.

Loo T 2001 Making a Modern Wilderness: Conserving Wildlife in Twentieth-Century Canada. *Canadian Historical Rev.*82 (1):91-121. doi: 10.3138/CHR.82.1.91.

Lynch BD 2012 Vulnerabilities, Competition and Rights in a Context of Climate Change: Toward Equitable Water Governance in Peru's Rio Santa Valley. *Global Environmental Change* 22 (2):364-373. doi: 10.1016/j.gloenvcha.2012.02.002.

Mark, BG Fernández A 2017 The significance of mountain glaciers as sentinels of climate and environmental change. *Geography Compass* 11 (6): 1-16. doi: 10.1111/gec3.12318.

Mark BG Baraer M Fernandez A Immerzeel W Moore RD Weingartner R 2015 Glaciers as Water Resources. In *The High-Mountain Cryosphere*, Huggel C Carey M Clague J Kääb A (eds). Cambridge: Cambridge University Press, pp. 184-203

Mark BG French A Baraer M Carey M Bury J Young KR Polk MH Wigmore O Lagos P Crumley R 2017 Glacier loss and hydro-social risks in the Peruvian Andes. *Global and Planetary Change* 159:61-76. doi: 10.1016/j.gloplacha.2017.10.003.

Markham A Osipova E Samuels KL Caldas A 2016 World Heritage and Tourism in a Changing Climate. United Nations Environment Programme, Nairobi, Kenya and United Nations Educational, Scientific and Cultural Organization, Paris, France.

Massey D 2006 Landscape as a Provocation: Reflections on Moving Mountains. *J Material Culture* 11 (1-2):33-48. doi: 10.1177/1359183506062991.

McDowell G Ford JD Lehner B Berrang-Ford L Sherpa A 2013 Climate-related hydrological change and human vulnerability in remote mountain regions: a case study from Khumbu, Nepal. *Regional Environmental Change* 13 (2):299-310. doi: 10.1007/s10113-012-0333-2.

McDowell G Stephenson E Ford JD 2014 Adaptation to climate change in glaciated mountain regions. *Climatic Change* 126 (1):77-91. doi: 10.1007/s10584-014-1215-z.

McDowell JZ Hess JJ 2012 Accessing adaptation: Multiple stressors on livelihoods in the Bolivian highlands under a changing climate. *Global Environmental Change* 22 (2):342-352. doi: 10.1016/j.gloenvcha.2011.11.002.

Mendoza M Fletcher R Holmes G Ogden LA Schaeffer C 2017 The Patagonian Imaginary: Natural Resources and Global Capitalism at the Far End of the World. *J Lat. Am. Geography* 16 (2):93-116. doi: 10.1353/lag.2017.0023.

Mitchell, WJT 2002 *Landscape and power* 2. ed., Chicago: University of Chicago Press.

Moore A 2016 Anthropocene anthropology: reconceptualizing contemporary global change. *J Royal Anthropological Institute* 22 (1):27-46. doi: 10.1111/1467-9655.12332.

Moore DS 2005 *Suffering for territory: Race, place, and power in Zimbabwe*. Durham, NC: Duke University Press.

Murti R Buyck C 2014 Safe Havens. Protected Areas for Disaster Risk Reduction and Climate Change Adaptation. Gland, Switzerland: IUCN.

Nash RF 2014 *Wilderness and the American mind*. New Haven, CN: Yale University Press.

Neumann RP 1998 *Imposing wilderness: struggles over livelihood and nature preservation in Africa*. Vol. 4. Berkeley: University of California Press.

Neumann RP 2001 Africa's 'Last Wilderness': Reordering Space for Political and Economic Control in Colonial Tanzania. *Africa* 71 (04):641-665. doi: 10.3366/afr.2001.71.4.641.

NPS (National Park Services) 2012 Revisiting Leopold: Resource Stewardship in the National Parks. A Report of the National Park System Advisory Board Science Committee. Washington, D.C.

Nüsser M Baghel R 2014 The Emergence of the Cryoscape: Contested Narratives of Himalayan Glacier Dynamics and Climate Change. In *Environmental and Climate Change in South and Southeast Asia : How Are Local Cultures Coping?*, Schuler B (ed). Leiden: BRILL, pp. 138-157

O'Reilly J 2017 *The Technocratic Antarctic: An Ethnography of Scientific Expertise and Environmental Governance*. Ithaca, NY: Cornell University Press.

Olwig KR 1996 Recovering the substantive nature of landscape. *Ann. Assoc.Am. Geographers* 86 (4):630. doi: 10.1111/j.1467-8306.1996.tb01770.x

Orlove BS Brush SB 1996 Anthropology and the Conservation of Biodiversity. *Ann.Rev. Anthropology* 25 (1):329-352. doi: 10.1146/annurev.anthro.25.1.329.

Paudel PK Heinen JT 2015 Conservation planning in the Nepal Himalayas: Effectively (re)designing reserves for heterogeneous landscapes. *Appl. Geography* 56:127-134. doi: 10.1016/j.apgeog.2014.11.018.

Polk MH Young KR Baraer M Mark BG McKenzie JM Bury J Carey M 2017 Exploring hydrologic connections between tropical mountain wetlands and glacier recession in Peru's Cordillera Blanca. *Appl. Geography* 78 (Supplement C):94-103. doi: 10.1016/j.apgeog.2016.11.004.

Purdie H 2013 Glacier retreat and tourism: Insights from New Zealand. *Mt. Res. and Development* 33 (4):463-472. doi: 10.1659/MRD-JOURNAL-D-12-00073.1.

Rasmussen MB 2015 *Andean Waterways: Resource Politics in the Peruvian Highlands*. Seattle, WA: University of Washington Press.

Rasmussen MB 2016a Unsettling Times: Living with the Changing Horizons of the Peruvian Andes *Lat. Am. Perspectives* 43 (4):73-86. doi: 10.1177/0094582X16637867.

Rasmussen MB 2016b Water Futures: Contention in the Construction of Productive Infrastructure in the Peruvian Highlands. *Anthropologica* 58 (2):211-226. doi: muse.jhu.edu/article/641050.

Rasmussen MB 2018 Paper Works: Contested Resource Histories in Peru's Huascarán National Park. *World development* 101:429-440. doi: 10.1016/j.worlddev.2017.05.005.

Rasmussen MB French A Conlon S forthcoming Conservation Conjunctures: Consent and Contention in Peru's Huascarán National Park. *Conservation and Society*.

Rasmussen MB Lund C 2017 Reconfiguring Frontier Spaces: The territorialization of resource control. *World Development*:388-399. doi: 10.1016/j.worlddev.2017.01.018.

Ribot J 2010 Vulnerability does not fall from the sky: toward multiscale, pro-poor climate policy. In *Social dimensions of climate change: Equity and vulnerability in a warming world,* Mearns R Norton A (eds). Washington, DC: The World Bank, pp. 47-74

Ribot J 2014 Cause and response: vulnerability and climate in the Anthropocene. *J Peasant Studies* 41 (5):667-705. doi: 10.1080/03066150.2014.894911.

Scott D 2005 Global environmental change and mountain tourism. In *Tourism and Global Environmental Change: Ecological, Economic, Social and Political Interrelationships*, Gössling S Hall CM (eds), London: Routledge, pp. 54-75.

Smith L Karosic L Smith E 2015 Greening US National Parks: Expanding Traditional Roles to Address Climate Change. *Professional Geographer* 67 (3):438-446. doi: 10.1080/00330124.2015.1028297.

Spence MD 1996 Crown of the Continent, Backbone of the World: The American Wilderness Ideal and Blackfeet Exclusion from Glacier National Park. *Environmental History* 1 (3):29-49. doi: 10.2307/3985155.

Steiger R Dawson J Stotter J 2012 Last chance tourism in alpine regions: Last chance to ski? In *Last Chance Tourism: Adapting Tourism Opportunities in a Changing World*, Lemelin H Dawson J Stewart EJ (eds). London: Routledge, pp. 42-54

Stewart EJ Wilson J Espiner S Purdie H Lemieux C Dawson J 2016 Implications of climate change for glacier tourism. *Tourism Geographies* 18 (4):377-398. doi: 10.1080/14616688.2016.1198416.

Sörlin S 2015 Cryo-History: Narratives of Ice and the Emerging Arctic Humanities. In *The New Arctic*, Birgitta Evengård B Larsen JN Paasche Ø (eds). Cham: Springer International Publishing: 327-339. Doi: 10.1007/978-3-319-17602-4_24

Taylor C 2002 Modern social imaginaries. *Public culture* 14 (1):91-124. doi: muse.jhu.edu/article/26276.

Tilley C 2006 Introduction: Identity, Place, Landscape and Heritage. *J Material Culture* 11 (1-2):7-32. doi: 10.1177/1359183506062990.

Trawick, P 2003 *The Struggle for Water in Peru. Comedy and Tragedy in the Andean Commons*. Stanford, CA: Stanford University Press.

Tsing AL 2015 *The mushroom at the end of the world: On the possibility of life in capitalist ruins*. Princeton, NJ: Princeton University Press.

Valdivia C Seth A Gilles JL García M Jiménez E Cusicanqui J Navia F Yucra E 2010 Adapting to Climate Change in Andean Ecosystems: Landscapes, Capitals, and Perceptions Shaping Rural Livelihood Strategies and Linking Knowledge Systems. *Ann. Assoc.Am. Geographers* 100 (4):818-834. doi: 10.1080/00045608.2010.500198.

Viviroli D Archer DR Buytaert W Fowler HJ Greenwood GB Hamlet AF Huang Y Koboltschnig G Litaor MI Lopez-Moreno JI Lorentz S Schaedler B Schreier H Schwaiger K Vuille M Woods R 2011 Climate change and mountain water resources: overview and recommendations for research, management and policy. *Hydrol. and Earth System Sciences* 15 (2):471-504. doi: 10.5194/hess-15-471-2011.

Vuille M Bradley RS Werner M Keimig F 2003 20th Century Climate Change in the Tropical Andes: Observations and Model Results. In *Climate Variability and Change in High Elevation Regions: Past, Present & Future*, Diaz HF (ed), Springer Netherlands, pp. 75-99

Vuille M Carey M Huggel C Buytaert W Rabatel A Jacobsen D Soruco A Villacis M Yarleque C Timm OE Condom T Salzmann N Sicart J-E 2018 Rapid decline of snow and ice in the tropical Andes – Impacts, uncertainties and challenges ahead. *Earth-Science Rev.*176 (Supplement C):195-213. doi: 10.1016/j.earscirev.2017.09.019.

Vuille M Francou B Wagnon P Juen I Kaser G Mark BG Bradley RS 2008 Climate Change and Tropical Andean glaciers: Past, Present and Future. *Earth-Science Rev.* 89 (3):79-96. doi: 10.1016/j.earscirev.2008.04.002.

Wakild E 2014 Acts of Courage, Acts of Culture: The Wilderness Act and Latin America. *Environmental History* 19 (4):728-734. doi: 10.1093/envhis/emu071.

Wakild E 2015 Parks, People, and Perspectives: Historicizing Conservation in Latin America. In *Protecting the Wild* Wuerthner G Crist E Butler T (eds), Washington, DC: Island Press, pp. 41-52

Welling JT Arnason T Olafsdottir R 2015 Glacier tourism: a scoping review. *Tourism Geographies* 17 (5):635-662. doi: 10.1080/14616688.2015.1084529.

West P Igoe J Brockington D 2006 Parks and Peoples: The Social Impact of Protected Areas. *Annual Review of Anthropology* 35 (1):251-277. doi: 10.1146/annurev.anthro.35.081705.123308.

Young KR Rodriguez LO 2006 Deveopment of Peru's Protected-Area System: Historical Continuity of Conservation Goals. In *Globalization and New Geographies of Conservation*, Zimmerer KS (ed). Chicago: University of Chicago Press, pp. 229-254

Zimmerer KS 1993 Transforming Colquepata wetlands: Landscapes of knowledge and practice in Andean agriculture. In *Irrigation at High Altitudes: The Social Organization of Water Control Systems in the Andes*, Mitchell WP Guillet D (eds). American Anthropological Association, pp.115-140